

Topics: *The Next Voyages to the Moon*

By WILLY LEY

The moon is still silvery in the night sky but it is no longer unreachable. For a number of years thousands of scientists, engineers and interested laymen have known that a trip was possible. The three astronauts of Apollo 8 have proved it to everybody on earth.

For a long time a journey to the moon was a subject of fiction. Italian and French newspapers told their readers yesterday that the reports from America sounded "like a story by Jules Verne." Jules Verne's story about a voyage to the moon with take-off from Florida was published just over a hundred years ago, in 1865, and it was not the first. The first was written by Lucian of Samosata in 160 A.D.

So much for fiction. What about moon facts for the future—the immediate 1969 future?

There are now three Saturn-V rockets in the Vertical Assembly Building at the Cape, as I could see when I watched the take-off of Apollo 8. There are also three LMs—pronounced "lem" and meaning Landing Module—ready or nearly so. The next step evidently envisions a combination of both, for no LM has yet gone through a space test. Apollo 7, the long orbital flight that was the first manned flight of the Apollo Command Module, did not carry a LM along, nor did Apollo 8.

The next mission probably will bring a space test for the LM. Naturally the Apollo 9 mission is not completely specified on paper at this moment, because the Apollo 9 mission will be shaped by the results of the Apollo 8 flight (just as the mission of Apollo 8 could not be put into its final shape until Apollo 7 was completed).

Landing Technique

For the actual landing, two astronauts will enter the LM and take her down to the surface while the Command Module and the Service Module stay in orbit around the moon. After the mission on the lunar surface is completed, the two astronauts return to orbit, using the upper portion of the LM, while its lower portion that did its duty as a take-off pad for the upper portion stays on the moon.

Then the two astronauts transfer to the orbiting Command Module and the return journey begins, leaving the upper portion of the LM in orbit around the moon.

These maneuvers have not been practiced yet, and that practice could well be the mission for Apollo 9—except that the LM would, in all probability, be landed empty. It will be "flown" by somebody in the Command Module and its upper part may be brought back into lunar orbit by remote control,

too. After this has been done, Apollo 10 might accomplish the actual landing.

When thinking about the first landing on the moon it is important to put emphasis on the word "first." It will be followed by a second—nobody can tell right now when that second landing will be made or who will make it. Then there will be a third, and a fourth, but by that time it will no longer be just for the sake of exploration.

The moon offers unique possibilities for research. Because of the intensity of radiation from the sun which is not mitigated by an atmosphere, specimens could be heated to almost any temperature by using a curved mirror. Similarly, specimens exposed to space (and shielded from earthlight) during the long lunar night will cool off to a temperature near absolute zero.

Good and Cheap Vacuum

On earth, a cubic yard of really good vacuum costs in the neighborhood of \$20,000, on the moon many cubic miles of an even better vacuum are available free of charge. And the lunar gravity is only one sixth of terrestrial gravity. Will this influence the growth of crystals, for example?

In short, the moon probably will be the site of a research laboratory where new insights into the laws of nature can be

obtained. New industrial processes could result. It is entirely reasonable to think a single new process will be worth the whole effort.

The astronauts who splashed down in the Pacific Ocean yesterday traveled almost a half-million miles to and from the moon. Watching, I could not help thinking of the early dreams and experiments. In 1930 I introduced a number of aeronautical engineers in Berlin to the first liquid fuel rocket they had ever seen. It stood about five feet tall and, even when fueled, was light enough to be lifted with one hand. It could climb about 1,500 feet and was brought back by a small parachute.

What, the engineers wanted to know, was the aim of all this? Eventually, I replied, rockets of this type will carry men to the moon. That, most of those present thought, would take about a century.

Yet from that time to the first landing on the moon in 1969 will be less than four decades. And from then on men will continue to go to the moon, not for adventure, but to learn.

Willy Ley, American educator and a pioneer writer about space exploration, was a founding member of the German Rocket Society in 1927. His latest book in this field is "Rockets, Missiles and Men in Space."